



FDM 9-55-1 Introduction

October 28, 1994

1.1 When Used

Whenever replacing or installing a bridge or box culvert involving the movement of water, hydraulic information is required. For Rehabilitation and Separation Structures, see Section 60 of this manual.

1.2 Data Collected

In general, drainage survey notes and mapping shall indicate the location and elevation on ditches, waterways, culvert outlets, tile lines, catch basins, manholes, existing structures, underground facilities, overhead facilities, trees etc.

1.3 Standards and Specifications

The specifications, standards and datums for all structure surveys shall conform to Section 35, Horizontal Control - Traverse and Section 40, Vertical Control.

1.4 Coordination

Coordinate all work that involves drainage regions with the drainage board of that region. The legal procedures for these cases are set forth in Chapter 86.075, 88.87 and 88.89 of state statutes.

FDM 9-55-5 Field Procedures

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5.1 Horizontal Alignment

Recover existing, or establish proposed, reference line and station for a minimum of 300 meters each side of the proposed site. The surveyor must locate by angle and stationing or coordinates all base lines that will be used for additional information, such as base line for stream channel cross sections (See [Attachment 5.1](#)).

5.2 Topography

Topography should include features within 150 meters of the site, at least to right of way width and 100 meters upstream and downstream along the stream bed. Locate all existing structure features including any auxiliary structure, utilities, curb and gutter, tile lines, drainage ditches, intersecting stream, island, old piers or footings, trees, building within the flood plain, banks of the stream, boat landings, etc. Record the type of vegetation in flood plain area. Contact Diggers Hotline far enough in advance to have all underground utilities located.

5.3 Profile

Profiles are required on the reference line of roadway for 300 meters each side of site. The profile at the stream bed and water surface profile should be established at the site, 150, 300, and 450 meters up and down stream. Additional profiles should be taken at any other spot that appears to be irregular, such as rapids, riffles, or stream bed scour. Any part of the roadway that would be below high water in an overflow section requires profiles. Although, not required for the structure survey report, the roadway designer will need topography and cross sections in the area of any overflow sections. Measure stream profiles along the thread of channel.

5.4 Cross Sections/DTMs

Cross sections or DTM's should be taken a minimum of 150 meters on each side of the structure along the reference line of the roadway, as well as a minimum of 100 meters on each side of the structure up and down the stream channel, with additional sections around the abutment ends to properly show shape and ends of fill area. The roadway cross section increment is usually 40 meters in rural areas and 20 meters in urban areas.

Sections up and down the stream channel can be taken from a base line or by random shots. The end result should be the capability to plot a contour map or Digital Terrain Model (DTM) of the area.

Take flood plain sections upstream and downstream from the site. The desired location of the area should be the distance of the span length measured from either edge of the structure. The cross sections should extend to a point that is above high water elevation and be taken in a representative reach of the natural channel, normal to stream flow at flood stage. See the drawing in [Attachment 5.2](#).

Also, obtain elevations at the entrances of all buildings in the flood plain. This information can be supplemented

by photogrammetric methods.

5.5 Existing Structure Information

Measure waterway openings at upstream, downstream and at site structure. Measure waterway areas in square feet (square meters) below high water and at 90 degrees to direction of flow. Obtain low (steel/concrete) elevations, deck elevations, top of rail or curb elevations, water on date of survey, high water elevations and any overflow areas at all structure sites. If possible, obtain high water elevations upstream and downstream (see [Attachment 5.3](#)).

The source of high water information can be local residents, county patrolmen, region bridge maintenance section or visible evidence. The field notes should identify the source, cause, and date of high water.

The same vertical datum must be used for all structures within 800 meters of the site. Check area between upstream and site structure for additional drainage contributing to flow at site, such as culverts and tributaries. Get dimensions, if applicable.

Take photos of all structures involved and any buildings within 50 meters of the site. Take a panoramic view looking upstream and downstream from the proposed site.

LIST OF ATTACHMENTS

Attachment 5.1	Horizontal Alignment at Drainage Structure
Attachment 5.2	Flood Plain Section at Drainage Structure
Attachment 5.3	Waterway Opening at Drainage Structure

FDM 9-55-10 Computations

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The hydraulic computations for bridges and box culverts that are designed by WisDOT staff are computed by the Office of Design. The region must provide the following computations:

1. Reduction of all field notes,
2. Vertical alignment including X-section or DTM data,
3. Horizontal alignment,
4. Waterway areas at the site,
5. Waterway areas of upstream and downstream structure,
6. Contour map,
7. Electronic files if applicable.

In addition, the region should complete the structure survey report forms with information from the field survey. See Chapter 6 of the Bridge Manual for more guidance on structure survey reports. Include a request for special navigational clearance, if applicable.

FDM 9-55-15 Monumentation Required

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The Highway Reference Line shall have a minimum of two, Type 2 or 3, monuments at the structure site. These points should be referenced by swing ties and, in some cases, tied to the Wisconsin High Precision Geodetic Network (WHPGN).

Bench marks should be set at the site with at least one bench mark on each side of the structure. These should be tied to the National Geodetic Vertical Datum of 1929 (NAVD 29) or to the North American Vertical Datum of 1988 (NAVD 88).